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Characterizing Surface Transport Barriers in the East Sea of Vietnam

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LONG-TERM GOALS

The long term research goal of this project is to develop a thorough appreciation of the key seasonal transport barriers that are responsible for organizing surface transport in the ocean waters off the coast of Vietnam. The long term educational goal is to enhance the capability of Vietnamese scientists to identify the existence transport barriers in geophysical data sets and understand the role of these transport barriers in the East Sea of Vietnam.

OBJECTIVES

To develop robust processing routines for the identification of surface transport barriers in velocity field and Lagrangian drifter data sets pertaining to the East Sea of Vietnam. Through application of these routines, the seasonal structure of surface transport barriers will be elucidated. Vietnamese scientists and students will be trained in the necessary methods. If HF radar capabilities are installed along the coast of Vietnam, real time processing of this data is sought to provide reliable nowcasts, and potentially forecasts, of strong surface transport events.

APPROACH

The primary research approach is to employ the method of Lagrangian Coherent Structures (LCSs) to identify transport barriers in velocity field data sets, which will be generated by numerical simulations run by collaborators or via HF radar if this capability is installed along the coastline of Vietnam. In addition, we shall investigate other mathematical tools, with one example being a recently developed Braid Theory method applied to Lagrangian drifter data.

The teaching approach is to provide one week workshops in Vietnam to educate Vietnamese scientists and students in both the mathematical foundations of LCS analysis and the use of MATLAB codes for executing the LCS analysis. The first courses are expected to be run in November and December 2012, in collaboration with Professor Ca (Hanoi), Professor Uu (Hanoi) and Professor Long (Nha Trang).

WORK COMPLETED

To date we have almost completed development and implementation of a MATLAB code for the new Geodesic approach to identifying LCSs. We have also run some tests of the Braid Theory approach to

Lagrangian drifter data provided by Dr. Luca Centuroni. Scheduling for the classes in Hanoi and Nha Trang in November and December 2012 is underway.

RESULTS

There have been no major results with the LCS processing as yet. The focus has been on development of the processing algorithms, and these have yet to be applied to data sets concerning the East Sea of Vietnam. The preliminary tests with the Braid Theory approach revealed some initial challenges, prompting further developments to enable more reliable assessment of whether a drifter data set contains enough information to identify transport barriers.

IMPACT/APPLICATIONS

The research has the potential to provide a new capability for ocean decision making strategies in the East Sea of Vietnam, in response to an oil spill or sinking ship for example, as well as improved understanding of natural transport processes, such as the fate of the Mekong River outflow.

RELATED PROJECTS

None.

HONORS/AWARDS/PRIZES

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